ELECTRICAL ENGINEERING

1. Write critical notes on any four of the following: (4x7½=30)

(a) Electrical characteristics of symmetrical networks.
(b) Modulation and Demodulation
(c) Special Machines and their applications
(d) Classification of magnetic materials depending on their behavior and applications
(e) Root Locus approach to control system design
(f) Energy Audit and its importance

PART I

2.(a) Derive expression for the slip of an induction motor corresponding to fifth and seventh harmonics in terms of slip at fundamental frequency s. (15)

(b) Discuss classification and methods of heating. Give a brief account of types of induction are furnaces, their application and comparison. (15)

3.(a) Find the image and iterative impedances of the network shown below:

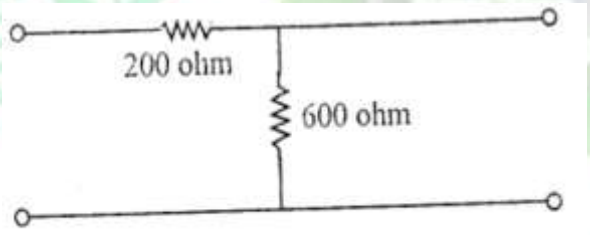

Fig.

Also find the insertion loss of the above network when it is placed between a generator and a load and having an impedance of 1 k ohm. (15)

(b) Explain Tellgen's theorem. (15)

4.(a) Explain with the help of neat block diagram working f a CRO. How is the gain width performance of a CRO enhanced? Discuss in brief about the types of CRO probes. (15)

(b) Prove that Poynting vector of a critically polarized wave is twice that of a linearly polarized wave if the maximum field intensity is same for both waves. (10)

(c) Giving comparison of various power semiconductors write in brief about the functional details of MOSFET. (10)

PART II

5.(a) Write various forms of state space representations of LTI Transfer Function System and give their significance. Obtain the various state space representation of the following system:

$$\frac{Y(s)}{X(s)} = \frac{s+3}{s^2 + 3s + 2}$$

Discuss the effect of adding poles and zeros to open loop transfer function. (15)

(b) Discuss the pole zero mapping of s plane into z plane. Explain the importance of primary strip and complementary strip. Show constant damping and constant attenuation loci in both planes. (15)

Prove the following identity:

$$Z\left[\frac{1^{-sT} - e}{s}\right] G(s) = (1 - Z^{-1})\, Z\left[\frac{G(s)}{s}\right]$$

6.(a) List the components of a computer and explain their functions. Differentiate between a microprocessor and a micro-computer.

Giving the functions of ALE and IO/M signals of 8085 microprocessor explain the need to demultiplex the bus $AD_7 - AD_0$. (15)

(b) Giving modes of operation uses and properties of piezoelectric crystals discuss loading effect and frequency response of piezoelectric transducers.

A parallel plate capacitive transducer has plates of 600 mm^2 area which are separated by air by a distance of 0.2 mm. The resistance of transducer is 20×16^6 ohm. Calculate the time constant of the transducer and find the attenuation of output at 1000 Hz. The permittivity of air is 8.85×10^{-2} F/m. (15)

7.(a) What do you understand by unit commitment in optimal system operation? Discuss various methods of obtaining UC Tables to be useful for optimum generation scheduling. Derive expression for Transmission Loss formula. (15)

(b) Discuss the essential qualities of protection and classification of protective schemes. What are the required properties of a CT used in protection? Explain the operation of a quadrilateral relay. (15)